
* INDIANA SINCLAIR-TIMEX NEWSLETTER *

March-April 1989

Editor-Frank Davis
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This issue....

Next meeting and Capitolfest
Editorial by Frank Davis, and Sinclair news
Mike Felerski's Burning The Midnight Oil
Mike Felerski's Things To Do
William J. Pedersen's Memory Bank Diagrams
William J. Pedersen's Memory Improves with Age

I.S.T.U.G. MEETING

The March meeting was held at The Ham Radio Show at the State Fairgrounds. The show was large enough that I do not believe all of us who went to the show were able to connect up.. ..As for example I was told that Steve Petrovic was to be there along with Willie Jones, but never ran into either one. Paul Holmgren, Frank Davis and Ted Heckman found some bargains. Next time we hold a meeting at a show I will make sure it is more organized.

The meeting for April 29th will be held at the Eagledale Public Library, meeting room, 3225 Lowery Road, Indianapolis, IN. This meeting will start at 1:30 P.M. This is one block East of Georgetown Road on 34th. For directions call Frank Davis at 317-473-8031 or Paul Holmgren at 317-291-6002.

The May meeting will be held at William Angel's, 2012 Goodlet St., Indianapolis, In. For directions call Bill at 317-637-9983, or Paul Holmgren at 317-291-6002. This will be on May 20th at 1:30 P.M. Usually the meeting would have been on the last Saturday of the month...but that is Memorial weekend and THE INDY 500!!!!

Just a reminder to the two people (nameless of course) who have not paid their dues. In June the price has to go up to cover paper, postage, ribbons, etc., our first increase. For now Full Membership is still \$10 and \$7.50 for Associate Membership. This will be going up in June to \$12 for Full Members and to \$9 for Associate Members. One other item: I need someone to help with the newsletter. I need someone to act as Publisher, handling the mailing, labeling, collating, etc. of the newsletter. I have material for more and more timely newsletters. What I do not have is the time for those mentioned tasks. I can write, and will gladly publish material from the members and other users, but am limited in the number of hours I can devote to the publishing side. I am willing to stay on as the Editor (unless you want someone else).

Carol and I (Frank Davis) are getting ready to head on out to the Capitolfest in Washington, D.C. We plan on having a good time playing with TS2068s, TS1000s and QLs, perhaps even a Z88. While there we also will hit some of the sights such as the Smithsonian, and maybe the Library of Congress and the National Geographic Museum. I am not too sure about the political monuments, but maybe. I hope to see some of you out there also, and perhaps we will "do lunch".

THE WORLD OF SINCLAIR COMPUTING

by FRANK DAVIS

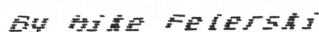
Besides the upcoming Capitalfest in D.C., the first weekend of May, what do we have to look forward to in the way of computer shows for the year 1989? Particularly those having some support for our special form of computing? One show you should try to attend is COMPUTERFEST '89. This is presented yearly by DMA (Dayton Microcomputer Association) Inc. Gary Ganger, who heads their Timex-Sinclair and Fourth Sigs is particularly active in presenting this show. His TS group will have a booth at the show, and hopefully Bill Bell of Columbus, Ohio will be presenting a lecture on using Disk Drives with the TS1000 again. Gary Ganger will naturally be doing a TS seminar also. Besides these attractions you can pick up printers, monitors, computer paper, chips, disks, power supplies, and even flea market deals on used Timex-Sinclair goodies. I plan on once again going to this show. We will have more on this upcoming show (August 26-27) in a later issue.

Zebra Systems Software will be at the Capitalfest. They will be attempting to sell out all of their remaining stock of peripherals and software. Be there and get some extremely good deals on a truckload of goodies.

Places still in business are RMG of 1419 1/2 7th St, Portland, Oregon, who recently purchased the remaining stock of Foote Software and E-Z Key. Send a LSASE to them for a list of these items. Also still in business is WMJ Data Systems, who now have all of the remaining stock of Knighted Computers TS lineup, and can be found at 4 Butterfly Drive, Hauppauge, NY. Also let us not forget BYTE POWER MAGAZINE, with on tape magazine and programs for the TS1000 and the TS2068 and Spectrum, of 1748 Meadowdale Ave., Pickering, Ontario, Canada L1V3G8. Those are only a few of those remaining on our side of the computing game. Support them by buying from them. Also start or continue your support of the quarterly magazine UPDATE magazine of 1317 Stratford Ave., Panama City, Florida 32404. They are putting out one heck of a magazine. I wish I could say the same presently for Time Designs Magazine. The truth is I do not know what to say. It was one of my favorite mags and I would have kept up my subscription forever, but I have only heard rumours about why they are not publishing. I have no facts to give and can only hope they will get back on track. I consider the Editor and owner, Tim Woods a friend, and someone who in the last few years has greatly benefited the TS community.

The QL IBM emulators are reported to be up and running fine and are available from RMG and from Sharps. If you want MS-DOS 4.0 it will cost extra from what I am told. It is not necessary to run the vast majority of IBM type programs, however. I will try to pick up a copy while I am in Washington next month.

I heard that a recent issue of Playboy Magazine carried some info on the Cambridge Z88 by Sir Clive Sinclair. Also Computer Shopper's Stan Viet thinks highly of the new little machine. Jerry Pournelle of BYTE has been testing out a Z88 also. What I have not yet seen is more than a handful of dealers selling them, such as Curry Computer, Sharps, RMG. It is an ideal portable for use with your QL, IBM or MACINTOSH. Cables for use with the Z88 are available for all of these machines.



Overall, **JazzoFire** is well worth the cost even though documentation is slim and the TDM articles focus more on the concepts of the code. It is, though, three programs that should not be left out of any personal library.

(And don't forget to say you heard about it from ISTUG.)

Things To Do:

Write article
on displaying
Zebra Systems
and Pixel
Print Icons
for upcoming
issue of the
ISTUG news-
letter.

Back in the early days of the TS2068, when non-Timex software began to spring up here and there Zebra Systems created what is now the 2068 Icon format. It became a standard when other powerful programs such

same format for icons.

The Zebra Systems or standard 2068 Icon picture format consists of 56 rows by 32 columns of pixels or dots. Both Zebra Systems and Lemke Software provide icon design programs as well as packages of predesigned icons. But my question has always been, "How can I display and use these icons in my own programs?"

I looked into several of the existing programs that deal with icons and found that they all called machine code routines. Well, I decided that there must be a way to at least display an icon on my screen using BASIC, after all, an icon is just 256 bytes of data and displaying one should only consist of a little PEEKing and POKEing. The only disadvantage I could see with BASIC would be that it would RUN slower than machine code.

So, I set my sights on deciphering those 256 icon bytes and the result is the following program which will load a Zebra format Icon from tape and display it in the upper left corner of the screen.

```
1 REM ICON DISPLAY PROGRAM
2 REM LOAD ICON AT 64000
3 REM PRINTS ICON AT 0,0
10 LET ad=16384
20 LET ic=64000
40 LET ct=1
50 LOAD ""CODE 64000
60 CLS
100 POKE ad,PEEK ic
110 POKE (ad+1),PEEK (ic+1)
120 POKE (ad+2),PEEK (ic+2)
130 POKE (ad+3),PEEK (ic+3)
140 LET ic=ic+4
150 LET ad=ad+256
160 LET ct=ct+1
170 IF ct=9 THEN LET ad=ad-(204
8-32): LET ct=1
180 IF ic>64256 THEN STOP
190 GO TO 100
```

The program is very straight forward and does not require any special tricks. All it does is POKE each of the icon bytes into its proper screen memory location. Try increasing the value of ad (start of screen memory). Increasing by 1 to 27 will move the icon across the top of the screen.

HOWARD JOHNSON PLAZA-HOTEL

C.A.T.S. CAPITOLFEST

RESERVATION REQUEST

May 5-8, 1989

Please Reserve the Following Accommodations:

_____ Single Occupancy Room(s)	\$62	per night
_____ Double Occupancy Room(s)	\$62	per night
_____ One Bedroom Suite (parlor and guestroom)	_____	per night
_____ Two Bedroom Suite (parlor and two guestrooms)	_____	per night
_____ Mini Suite	_____	per night

Extra person in Room \$10.00 Per Night

No Charge for Children 17 Years and Under

Please Add 10% Tax to Above Rates.

CHECK-IN TIME AFTER 1 PM

ARRIVAL DATE _____

DEPARTURE DATE _____

NAME _____

ADDRESS _____

_____ ZIP _____

TELEPHONE (Area Code) _____ (Number) _____

Reservation must be received by **April 5, 1989**

All Reservations Must Be Accompanied By One Night's Room Rate Plus Tax as Deposit or Credit Card guarantee. Guaranteed Reservations Held Until 7 A.M. Following Day. All Reservations Not Cancelled Prior to 4 P.M. on Arrival Day will be Charged One Night's Room Rate plus Tax.

Deposit (check) Enclosed _____

Credit Card Guarantee _____

Credit Card Company _____

Credit Card Number _____

Credit Card Expiration Date _____

HOWARD JOHNSON PLAZA-HOTEL

301-459-6700

S. N. U. G.

Sinclair Northamerica Users Group

MEL NATHANSON

(813) 863-5552

7515 Arbordale Drive
Port Richey, Florida 34668

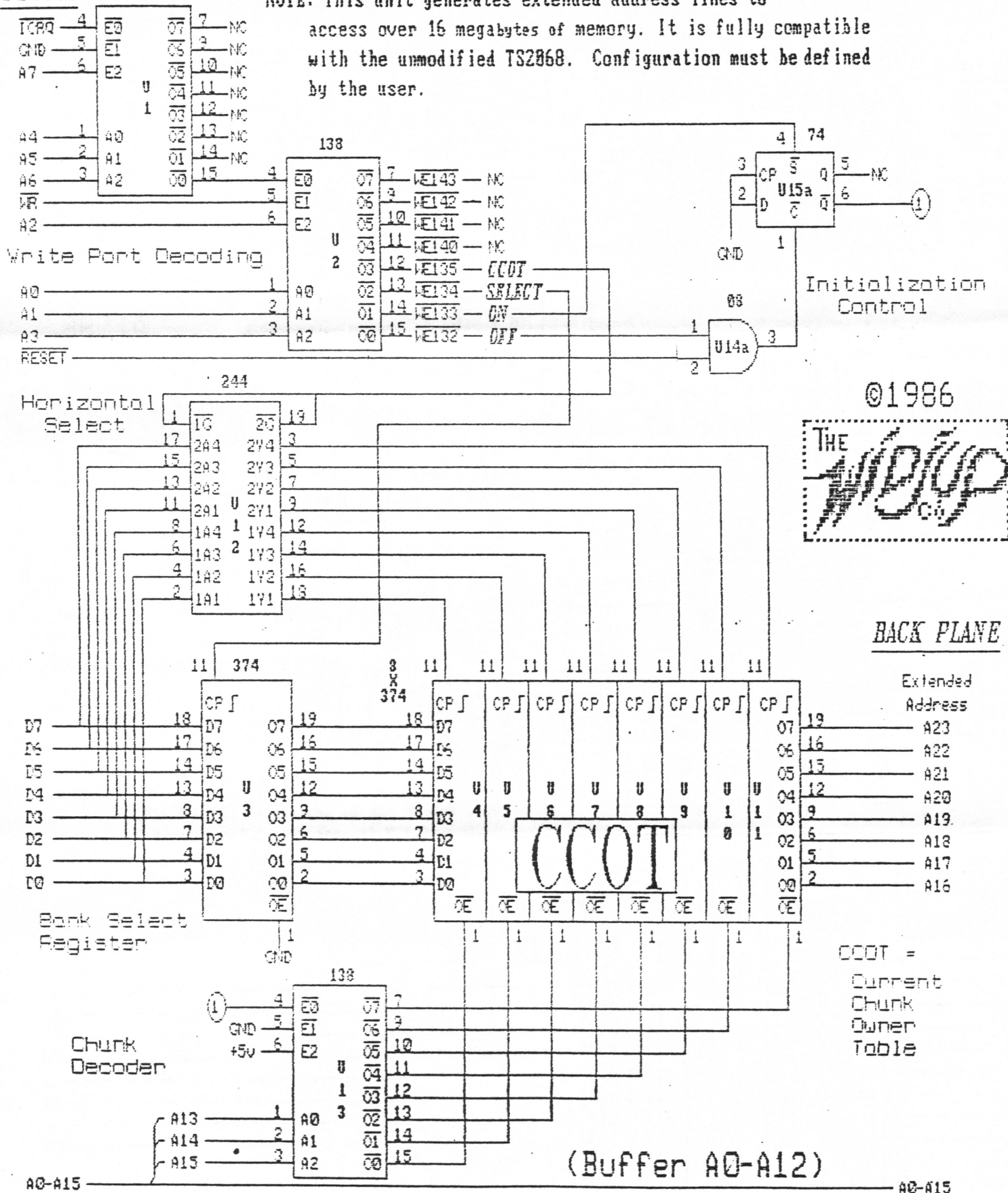
Figure 1: Bank Switching

TS2068

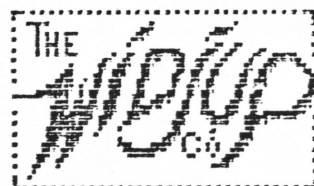
138

NOTE: This unit generates extended address lines to

access over 16 megabytes of memory. It is fully compatible with the unmodified TS2068. Configuration must be defined by the user.



©1986



BACK PLANE

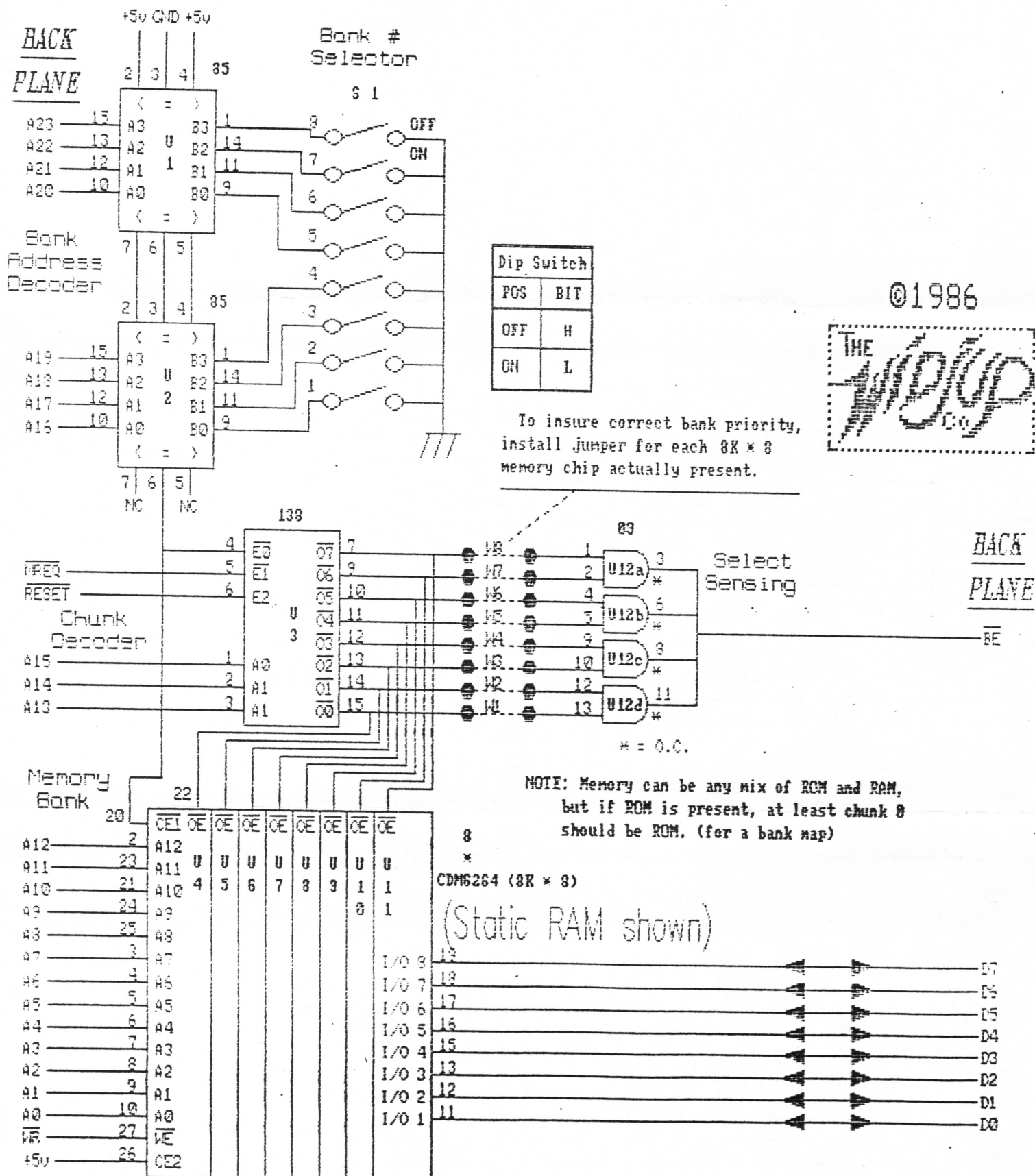
Extended
Address

A23
A22
A21
A20
A19
A18
A17
A16

A0-A15

A0-A15

Figure 2: Memory Bank



MEMORY IMPROVES WITH AGE ?

Crazy? Perhaps so, but survival of our favorite antique TS2068 computer depends on it to a degree. Two advances are primarily responsible for this. Both extend the amount and speed of available memory, over and beyond that in the DOCK bank.

Disc drives improve speed, accessibility and convenience over tape recording.

RAMDISK has broken all speed records and has expansion possibilities which are impressive.

Now all we need to do is find some way to bank switch additional memory. It has been said it can't be done because TIMEX expertise has been dispersed....DINOSAUR CHIPS !

While it is true that the system TIMEX intended (before killing it) is highly complex, it is NOT the only system which works. The one described in Figures 1 and 2 is just about the minimum bank switching system. There are a lot of features like handling interrupts and auto-configuring that are beyond it, but it can address 16 megabytes of memory and works with the unmodified TS2068.

MEMORY BANK (Figure 2)

There is nothing particularly special about this memory bank. It decodes a 24 bit address and has a dip-switch to locate 64K of contiguous memory space at any 64K boundary.

If any of its memory is active, it drives the BE signal low to disable LOCAL HOME, EXROM and DOCK banks. With this system it is impossible for two expansion banks to be on the bus at the same instant. (See Appendix A for greater detail.)

SYSTEM CONFIGURATION

There must be some way to MAP all or part of memory.

The simplest way to do this is to write programs which assume continuous memory up to a variable limit, and warn you when that limit is exceeded. For this, each expansion bank should have dip-switches set from 1 to MAXBANK in sequence.

There are better ways which allow unused available banks to be switched around where needed; saving \$\$\$\$\$. This needs some programming overhead, but you have ROOM for it.

AUTO-CONFIGURATION

This is where the computer is programmed to go out to explore the neighborhood. Whatever it finds is recorded into a system configuration table (SYSCON) for later reference.

THIS IS NOT EASY!

A DUMB device cannot be found because it cannot answer a roll-call. It is deaf to attention-getting methods. It can be made visible by attaching a baby-sitter chip which can respond and identify itself and the attached device.

A SMART device listens, answers, and often calls for attention. Still, it must also accept an order to shut up so it won't interrupt. The IEEE488 system is a system for standardizing command language between widely different computers and devices, but it is still not smart enough to keep quiet when another device with the same "name" is on the system bus.

Duplicate names can be resolved if they are at different addressable

MEMORY (Cont.)

locations. In this way, one of the names can be changed to avoid future confusion and wasted time. It only needs to be done initially, or when some outside event has created another duplication (Like turning on a disc drive).

A DAISY CHAIN is one way to resolve the unique address problem.

Another common method is to give back-plane slots an address on a temporary basis. (perhaps expandable using a DAISY CHAIN)

Both methods assume something about the design of the connecting NETWORK. It must guarantee reaching only one device at a time.

NETWORKING

Almost by definition, a network is where Murphy lives. Frequently the unexpected happens. No more than three points will be made here.

1. Statistical methods must be used to find time slots when bus confusion is absent by chance.
2. If this works, there is no need for physically unique addresses, though default names still help.
3. Any device connected to a network can help by introducing a random delay to that natural to the system.

BANK SWITCHING

A bank switching controller (BSC) is essentially a network switchboard. The TS2068 operating system expects eight equal 8K wide channels assigned arbitrarily to CHUNKS.

The Z80, like most CPUs, has channels to internal registers; and internally swaps between register sets. It is a bank switching controller itself.

Machine code includes extended addressing provided by additional fetched bytes. Prefix bytes allow instruction sets to be bank switched.

The 8088 CPU used in the IBM PC and clones has four dedicated internal bank switching registers whereas the Z80 has none. This idealistic approach for the 8088 worked like a charm until it ran into deep water. It outgrew its island and couldn't build a boat. Externally, bank switching registers do not have these limitations.

The BSC in Figure 1 is similar to the one inside the 8088, but there the resemblance ends. It has eight channels instead of four, and can address sixteen times as much space.

There are better BSCs than the one in Figure 1, but this one does a POWERFUL job. It also requires no alteration of your precious TS2068...a good compromise.

BANK SWITCHED OPERATION

The most significant three bits of Z80 address space are used to select one of eight previously established address extension bytes in a current chunk owner table (CCOT). The remaining bits address locations within each 8K channel.

When power is first turned on, and at other times when the TS2068 needs exclusive control, CCOT must be turned OFF. Turning it ON could be a problem.

Fortunately we can first assign all eight channels to HOME. The extended address is 255 for which nothing usually responds. Then nothing happens when CCOT is turned ON. (The "usually" reference is explained later.)

With CCOT turned OFF extended address bits float, unless something is connected to force them high. In effect, the OFF condition also gives

MEMORY (Cont.)

255 for the extended address. That is exactly why HOME bank was assigned that bank number.

BANK SWITCHING CONTROL

Except during power-up there is no safe place in physical memory to put bank switching code. Only the fetched instruction in the Z80 is immune. That instruction must be able to find the BSC regardless of memory assignments. It must use I/O (another example of Z80 bank switching). Because GO TO and CALL are not I/O instructions, and the machine stack is unsafe anyway, each bank chunk using these needs to support them with MACROS having the same effect. The same applies to the RETURN instruction.

The most elegant method avoids using these by continuing the code in the shadowing bank and leaving the chunk with the current machine stack untouched.

This flexibility is what makes multitasking and multiuser time sharing systems remarkably easy to create. Each user can have his own private partition under control of a SUPERVISOR. Security from program interference remains a problem with the Z80, not like other CPUs which provide privileged instructions. Certain programming conventions will have to be followed to compensate for this.

There is great pressure to reserve one chunk to one bank to hold the system variables (SYSVARs), machine stack and bank switching routines. This is the technique used in the relics of machine code remaining in the unmodified TS2068. If repeated in each user's partition, this is a good convention to use. It should be remembered that it is still a convention, and need not be followed.

The relics use memory mapped bank switching ports. Unless these port addresses are forbidden to be used in all banks, it doesn't work. The BUG consists of stacking the port byte from one bank and restoring it in another, thereby destroying it in the new bank. There is a way to switch stacks to resolve this problem, but is too complex for serious consideration.

Global SYSVARs can be stored in I/O space, so this is not a real difficulty. The same applies to a bank switching stack run by the MACROS already mentioned. An alternative for the bank switching stack is to dedicate a fixed bank and chunk for it, though this has the problem of not remaining safe from accident.

MOST OF THIS DOES NOT APPLY TO THE BSC IN Figure 1. IT HAS BEEN INCLUDED TO SHOW WHAT CAN BE DONE WITH A MORE ADVANCED VERSION.

Control is simple. This BSC is write-only. It has eight ports of which only four are presently used. The port assignments avoid those to which the ZX and TS2040 printers respond and all known physical interface ports like the MODEM and TASMAN.

<u>PORT</u>	<u>DATA</u>	<u>FUNCTION</u>
132	x	Turn CCOT OFF
133	x	Turn CCOT ON
134	Bank #	Owner to be posted to CCOT
135	"HS"	CHUNK mask, active LOW.

Bank # is identical to the extended address byte.
OUT 134, Bank # writes the bank number into a register which maintains it as input to CCOT.

MEMORY (Cont.)

"HS" is the "Horizontal Select" described by TIMEX. Looking at the structure of CCOT, it makes sense. OUT 135, HS latches the stored Bank # into CCOT registers for which HS bits are active LOW.

Some of the more significant bits can be ignored in smaller systems, which explains why EXROM is Bank # 254 and DOCK is Bank #0. A system using only the lower nibble can still address 1 megabyte of memory.

Control can be safer from accident by using one of the unused ports to act as "SIMON SAYS". This was the real purpose of the TIMEX RESET NIBBLE SEQUENCE bank switching instruction, though never explained.

EXCEPTIONAL CONDITIONS

Bank numbers from 1 through 253 are gravy, but what about HOME (255), EXROM (254), and DOCK (0)? Can they be implemented as real external banks? The answer is definitely yes, with some limitations.

HOME ROM can be replaced with EPROM at the drop of a hat. An almost trivial case is replacing it with SPECTRUM ROM. What is NOT trivial is the resulting SPECTRUM having bank switching capabilities! Repairs to the TS2068 ROM code can be made in EPROM with impunity. Unlike other banks, bank 255 is active immediately at power-up. Because SPECTRUM is a subset of TS2068, it remains a toy with which to play. The real power lies in installing upward compatible extensions to BASIC and to restore TIMEX disabled functions like OPEN, CLOSE, RESET and CATALOGUE.

EXROM cannot be directly replaced without removing it from the case, and even then, it is not available during power-up. The problem with internal EXROM is that it is incompletely addressed so an image of it appears in all chunks, not just chunk 0. The addressing problem can be solved by moving the chip to a special card which plugs into the cartridge slot. This card doesn't change anything except to provide full addressing to suppress the false images. Of course, if EXROM is replaced with EPROM you can make repairs to code. In any case, you now have chunks 1 through 7 of Bank # 254 (enabled by EXROM signal) which you are free to use. On the expansion bus Bank # 254 will have priority over this, but it is not active during initialization.

DOCK is usually enabled by the ROSCS signal available at the cartridge slot. If you relocate it to the expansion bus as Bank # 0, it has priority when ON, or can act the same because the ROSCS signal is available on the expansion bus.

If you have no back-plane, the EXROM relocation card is the perfect place to include replacement HOME ROM using a technique described in another article for recovering the ROMCS signal logically--as it is not available at the cartridge slot.

For the same reason, this card should carry a replacement card edge connector so you can still use your cartridges.

Should you desire, once the system has been initialized, and you DO have an expansion bus, even these replacements can be replaced by the external higher priority back-plane cards. When this is done, EXROM and DOCK are no longer mutually exclusive.

SUMMARY

While the Bank Switching System described in Figures 1 and 2 has limits on what it can do, it should start a revolution.

MEMORY (Cont.)

It is simple enough to understand, uses easily obtainable parts, and any reasonably competent hardware hacker can build it. It doesn't put your TS2068 at risk, and even if EXROM is relocated, there are no wiring changes internally so you can always put it back.

A lot of mental sweat went into creating this version. The main reason for it is to give the user confidence that it can indeed be done as advertised. Perhaps later someone will actually believe that a full self-configuring system actually exists (which it does).

It nevertheless is one **GIANT STEP** for the TS2068.

ONCE TAKEN.....WATCH OUT!

(C) 1987 William J. Pedersen



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